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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF ANIMAL INDUSTRY.—BULLETIN 141.

A. D. MELVIN, CHIEF OF BUREAU.

THE IMPROVEMENT OF THE FARM EGG.

BY

HARRY M. LAMON AND CHARLES L. OPPERMAN,  
*Junior Animal Husbandmen, Animal Husbandry Division.*



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1911.



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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF ANIMAL INDUSTRY,  
*Washington, D. C., May 29, 1911.*

SIR: I have the honor to transmit the accompanying manuscript entitled "The Improvement of the Farm Egg," by Harry M. Lamon and Charles L. Opperman, of the Animal Husbandry Division of this bureau, and to recommend its publication as a bulletin in the bureau series. In 1908 a careful survey of the conditions surrounding the egg trade was made and published as Circular 140, "The Egg Trade of the United States," wherein it was shown there was a very large loss in our annual egg output, nearly all of which was due to improper methods of handling on the farm and at the country store. A conservative estimate of this loss was given as 17 per cent of the total value, amounting to about \$45,000,000 annually.

Practically all of this loss is borne by the farmers and other egg producers, and a large part of it should be easily preventable. In order to show how this loss might be prevented, the bureau last year sent the authors of the present bulletin into the State of Kansas to conduct investigations to this end. The results of the first season's work are described herein.

It is believed that Mr. Lamon, who outlined the field work, has struck the keynote in the solution of the problem by bringing about the organization of the egg buyers, with the cooperation of the State authorities, for the purpose of compelling the traders in eggs to buy on a quality basis only—in other words, to substitute the "loss-off" method of buying for the prevailing "case-count" system. Probably the best evidence that the work of the bureau in this matter had been well directed is the rapid spread of the movement into other States.

The authors desire to acknowledge the assistance of Mr. Alfred R. Lee, of the Animal Husbandry Division, who was in the field at the same time. They also wish to thank the egg merchants, railroad officials, agricultural college officers, and the State board of health of Kansas for valuable cooperation.

Respectfully,

A. D. MELVIN,  
*Chief of Bureau.*

HON. JAMES WILSON,  
*Secretary of Agriculture.*



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## DEFINITION OF TERMS USED IN THE EGG TRADE.

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*Candling.*—The process of testing eggs by passing light through them so as to reveal the condition of the contents.

*Checks.*—Eggs which are cracked but not leaking.

*Leakers.*—Cracked eggs which have lost a part of their contents.

*Dirties.*—Eggs soiled with earth, droppings, or the contents of broken eggs.

*Blood rings.*—Eggs in which blood has developed, extending to the period when the chick becomes visible.

*Floats, light.*—Eggs in which embryo development has proceeded to a point corresponding to about 18 to 24 hours of normal incubation; they are not readily detected by the casual observer, even when broken.

*Floats, heavy.*—Eggs in which the development has proceeded further than is the case with the light floats. When broken, the yolk has a white and creamy appearance.

*Rots.*—A term used in the egg trade to designate eggs absolutely unfit for food purposes.

*Spots.*—Eggs in which bacteria or mold growth has developed locally and caused the formation of a lumpy adhesion on the inside of the shell.

*Watery eggs.*—Those in which the inner membrane of the air cell is ruptured, allowing the air to escape into the contents of the eggs, and giving a watery or frothy appearance.

*Weak eggs.*—Those in which by reason of unfavorable conditions or of age the stiffness or viscosity of the egg white is lessened, producing an egg which does not stand up well or whip into a firm froth.

*Casc count.*—A term used in egg buying where eggs are accepted simply on the basis of number without regard to quality.

*Loss off.*—A term used in egg buying where eggs are tested by candling before being accepted. The bad eggs, usually the rots and broken eggs, are rejected and no pay is received for them.

*Seconds.*—A term often used when eggs are bought on a graded basis to designate usually the second-best grade.

*Flats.*—The square of strawboard which is placed between layers of eggs in the egg case.



# THE IMPROVEMENT OF THE FARM EGG.

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## INTRODUCTION.

It is an accepted fact that the commercial egg of this country is of a very poor quality, and when the housewife purchases eggs of the local grocer she is often compelled to break them first in a saucer before using them for culinary purposes. This poor quality in eggs has been attributed by the majority of persons to the retention of the eggs in cold storage until a large per cent of them are unfit for human consumption. This condition, however, is not as a rule due to cold storage, but to the condition of the eggs when they go into storage. If eggs are full and fresh when put into a well-equipped and properly managed cold-storage house there is, practically speaking, no change in quality during the period they are normally held which renders them unfit for food. On the other hand, if eggs are heated, shrunken, watery, or otherwise deteriorated when they reach the storage house, they can not improve in quality by virtue of being held at a low temperature and are quite likely to deteriorate to a still greater extent. In other words, the function of cold storage in the case of eggs is to retard or prevent changes which are unfavorable to good quality.

From the time the eggs reach the poultry packer or other large buyer of eggs they are as a rule given good care, and the deterioration from this point until they go into cold storage or reach their ultimate market is comparatively small. While there is, undoubtedly, still room for improvement during this period of the egg's journey to market, conditions are on the whole too satisfactory to account for the very serious deterioration which is so widespread and marked.

It is therefore necessary to go further back in the process of marketing and to study the conditions surrounding the production and handling of eggs from the farm to the packing house, if a really noticeable and substantial improvement is to be effected. The Bureau of Animal Industry has undertaken to grapple with this problem and a report of the preliminary work was published in 1909, as Circular 140, entitled, "The Egg Trade of the United States." This circular gives a bird's-eye view of the situation in all sections of the country and forcibly demonstrates the need of procuring more detailed information on this subject.

The work described in the present paper deals mainly with the situation in the Middle West and particularly in the State of Kansas. The objects sought to be attained are, to improve the quality of commercial eggs by investigations on the ground to determine the reasons for the poor quality of eggs so frequently seen, to devise methods for improving the present conditions economically and reduce the loss to a minimum, and, by a campaign of education, to disseminate the results of the investigation in other sections of the country where similar conditions prevail in the egg trade. The loss represented by improper handling of eggs on the farm and in the country store is, in the main, a preventable one. It is borne directly both by the producer and the consumer, and affects the consumer also by curtailing the egg supply of the country as well as by lowering its quality. By preventing this loss it is possible for the farmer to realize a greater profit and for the consumer to be more certain that he is purchasing eggs of reasonably good quality.

#### EXTENT OF THE INDUSTRY.

There is probably no other domestic animal which has a more general distribution than the hen, and the part which she plays in the agricultural wealth of this country is almost incredible. According to the most recent statistics of the Department of Agriculture, the products of the American hen aggregate a total value of more than \$620,000,000 annually. This sum is stated to be equal to the value of the hay crop for 1908 and greater than the combined value of oats and potatoes for the same year. It is nearly nine times the value of the tobacco crop and equal to that of wheat.

Poultry and eggs are produced in all sections of the country, but the business finds its greatest scope in areas presenting the most favorable conditions. It is a noticeable fact that the bulk of these important products is produced on the farms of the Mississippi Valley. In this section there are practically no large intensive poultry farms such as are commonly found in the Eastern States and on the Pacific coast. Poultry keeping, therefore, is largely incidental, the hens being considered and treated largely as an agency for converting material which would otherwise go to waste into a salable product. Consequently the poultry and eggs produced constitute merely a by-product of the general farm. Because prices for poultry products are comparatively low the farmers make no effort to keep larger flocks than can be supported by this waste without much attention or extra feed, and because individual flocks are small little attention or thought has been given to improving the product or the method of disposing of it. It should be kept in mind, however, that while individual sales of poultry products are small, the aggregate for the year is large, reaching for each State in the Middle West a total of many millions of dollars.

## LOSS DUE TO POOR HANDLING.

The estimate of the author of Circular 140 of this bureau places the annual loss for the entire country at 17 per cent of the total value of the crop, or \$45,000,000 annually. A vivid idea of what this loss means to the State of Kansas alone may be obtained from the following statement contained in a circular letter distributed by the packers and car-lot shippers of that State:

It is the belief of those who are in a position to know that the value of the egg product of the State of Kansas would be increased approximately \$1,000,000 annually if proper care were taken of the product by the farmer and merchant.

More accurate figures show that the loss varies during the year from 5 to 25 per cent, depending largely on the time of year and weather conditions.

The following table gives a condensed report of the total receipts of three Kansas egg buyers during the months of July, August, and September, 1910, showing the number of rots thrown out as the result of candling as well as the number of seconds and checks in two instances:

TABLE 1.—*Showing loss in eggs received by three Kansas buyers in summer months of 1910.*

Month.	Local-ity.	Total receipts.	Firsts.			Seconds.		Checks.		Rots.	
		<i>Dozens.</i>	<i>Dozens.</i>	<i>P. ct.</i>	<i>Dozens.</i>	<i>P. ct.</i>	<i>Dozens.</i>	<i>P. ct.</i>	<i>Dozens.</i>	<i>P. ct.</i>	
July.....	A	223,230	207,240	92.9					15,990	7.1	
	B	100,899	60,644	60.2	27,900	27.6	5,057	5.0	7,298	7.2	
	C	36,600	28,970	79.2	5,136	14.0			2,494	6.8	
August.....	A	160,320	133,620	83.5					26,700	16.6	
	B	71,430	45,055	63.1	17,265	24.1	3,503	4.9	5,607	7.8	
	C	46,500	31,151	67.0	8,997	19.3	1,978	4.2	4,374	9.4	
September.....	A										
	B	42,710	29,659	69.5	8,460	19.8	2,083	4.8	2,508	5.8	
	C	24,880	17,260	69.4	5,253	21.1	889	3.5	1,478	5.9	
Total.....		706,469	553,599	78.3	73,011	10.3	13,510	1.9	66,449	9.4	

It will be seen by an examination of the above table that the total receipts of the three localities were 706,569 dozen. At 15 cents a dozen, which is about the average price for "firsts" during the months of July, August, and September, the value of the total receipts would be \$105,985.35. However, 152,970 dozen, or 21.7 per cent, of these eggs did not pass as "firsts." Of this number 86,521 dozen were classed as seconds (which includes checks), and 66,449 dozen were "rots." It will be noticed that locality A does not discriminate against seconds and checks. This condition makes the actual loss in seconds and checks less than it would be under the candling system of localities B and C. The per cent of "firsts" is also necessarily greater. When buying on a loss-off basis the price paid for seconds is from 1 to 8 cents per dozen less than the price of firsts. At 6 cents this would mean a loss of \$5,191.26 in localities B

and C. The 66,449 dozen "rots" represent a loss of \$9,967.35. Thus there is from eggs thrown out and from those depreciated in quality a total loss of \$15,158.61, or 14.3 per cent of the original value, and this does not include the possible losses from seconds and checks in locality A.

The following table, giving the weekly receipts of still another buyer, shows the percentage that were classed as "firsts" during the months of June to October, 1910, inclusive.

TABLE 2.—Percentage of eggs classed as firsts in weekly receipts of one buyer.

Week beginning—	Percentage of firsts.	Week beginning—	Percentage of firsts.	Week beginning—	Percentage of firsts.	Week beginning—	Percentage of firsts.
June 4.....	94.13	July 16.....	80.88	Aug. 27.....	83.68	Oct. 8.....	91.88
June 11.....	88.31	July 23.....	80.57	Sept. 3.....	83.11	Oct. 15.....	91.44
June 18.....	86.43	July 30.....	63.68	Sept. 10.....	88.64	Oct. 22.....	94.24
June 25.....	84.15	Aug. 6.....	66.53	Sept. 17.....	86.75	Oct. 29.....	91.25
July 2.....	80.00	Aug. 13.....	87.75	Sept. 24.....	86.82		
July 9.....	85.82	Aug. 20.....	87.71	Oct. 1.....	91.66		

The figures given above are based on an average weekly business of 15,000 dozen eggs. The decline in quality with the increased severity of the summer heat can be readily traced. This decline reached its maximum during the last week of July and the first week of August, when the weather was unusually warm. After this time the number of eggs classed as "firsts" rapidly increased. It should be kept in mind, however, that in classing these eggs as "firsts," practically all except "rots," spots, blood rings, badly heated eggs, and broken eggs were included. The apparent improvement does not, therefore, indicate that there had been any improvement in shrunken eggs or others less badly deteriorated.

These two tables show a serious condition, which, moreover, is not limited to the particular cases specified, but is widespread and common. Under the case-count system of buying the producer stands this loss, although, as will be explained later, he does not realize it. How much better it would be for a system of marketing to be brought into general use which would make him realize this loss directly and thereby provide an incentive to market his eggs in a more careful and rational manner. The so-called "loss-off" is such a system. Needless to say a strong effort is being made by this bureau to encourage the introduction of this system.

#### FACTORS INFLUENCING QUALITY IN EGGS.

##### THE CASE-COUNT SYSTEM OF BUYING.

Viewed from the standpoint of progress and the improvement of the poultry industry of the Middle West, the system of marketing in general use in this great producing section known to the trade as the



"case-count" system has proven a great stumbling block. It is a system of payment for number alone regardless of quality, and in consequence it has not only not provided an incentive for care and attention to quality, but by neglecting to reward carefulness has even encouraged careless and dilatory marketing on the part of farmers, with the attendant loss in quality. Briefly, case-count buying consists of the payment of the fixed price which happens to be current at the time for each and every dozen eggs which may be offered for sale, regardless of whether the eggs themselves are good, bad, or indifferent. The only requisite in most cases to consummate a sale is for each egg to have an intact shell. The case-count system of buying eggs may, therefore, be said to be the greatest factor in preventing an improvement in the general quality of commercial eggs. No more practical step can be taken, or one which would have a more immediate and far-reaching effect in improving the quality of the eggs of the Middle West, than to discard this system of buying and to replace it by the one known to the trade as "loss-off," in other words, to buy on a candled or quality basis.

#### THE LOSS-OFF SYSTEM OF BUYING.

Where this system is in use the eggs as bought are "candled," that is, subjected to a test which shows quite definitely their condition and quality. Candling is performed by holding the eggs up to a small hole, about the size of a half dollar, cut in a shield of metal or other material, behind which is a strong light. Usually this light is furnished by an ordinary 16-candle power incandescent light, but a lamp, candle, or even the sunlight may be utilized. The person candling the eggs is in a dark or semidark room, so that the light shines through the eggs, and when the latter are twirled the condition of the contents is at once revealed to an expert eye. By this test it is possible to detect rots, spots, and other deteriorated eggs, such as shrunken, weak, watery, and heated eggs. In paying for eggs bought on this basis, the rots and usually the spots and blood rings are thrown out entirely, so that they become a dead loss to the person responsible for them. Often in buying from the farmer no other distinction is made. The eggs are simply divided into two classes, one of which is good enough to accept and pay for while the other is rejected and payment therefor is refused. Such a classification is a distinct step forward and results in a great improvement in the eggs. Indeed, there are many reasons to believe that such a simple system is preferable when dealing with the farmers to a more complicated one where the eggs are placed in several grades, according to quality, and for which different prices are paid. In the latter case the farmer is prone to think that he is being cheated if a part of his eggs are accepted but bring a less price than the others.

The agency indirectly responsible for the opposition to this method of buying and for the continuance of the case-count system is the country store.

#### THE COUNTRY STORE.

It has been the custom from the time towns were settled throughout the West for the country store to handle the eggs in most instances.

The peculiar workings of this system, together with its baleful effects, have been well discussed by Milo M. Hastings in Circular 140 of this bureau. He says:

The trips to the general store, necessary to supply the household needs, offer the most convenient opportunity for this marketing; but there is a reason for the general merchant being an egg buyer that is more interesting and far-reaching in its effect upon the egg trade. The merchant buys eggs because by doing so he can control his selling trade. There are two reasons why the farmer trades where he sells his eggs: (1) Because it is convenient to trade at one place, and (2) because he wishes to avoid offending the merchant, which he would do if he broke the established custom of trading out the amount.

The merchant knows that to buy eggs means to sell goods, and he therefore bids for eggs. His competitors in the same town, as well as in other towns, also bid for eggs. The effect to the merchant of lowering the price of his goods or raising the price of eggs is financially the same. In either case it is the matter of cutting prices under the spur of competition. Now, the articles on which the merchant makes his chief profits are dry goods and notions. Such articles are not standardized, but their real value varies in a manner quite impossible of estimation by the unsophisticated. On the other hand, eggs are quoted by the dozen, and all who run may read.

Suppose, for illustration, two merchants in the same town are each doing business with a 20 per cent profit and are buying eggs at 10 cents and selling for 11, the 1 cent advance being sufficient to pay for the labor of handling, incidental loss, and a small profit. One merchant concludes to cater for more trade. If he marks his goods down he will gain some extra trade, but people will fear his goods are cheap. But let him put out a placard "Eleven cents paid for eggs," and the farmers will throng his store and be less inclined to question the quality of his goods. This move having been successful, his rival across the street quietly stocks up with a cheaper line of dry goods, and one fine morning puts out a card, "Twelve cents paid for eggs," and more farm wagons will be hitched on his side of the street. The volume of business at the lower profit being insufficient to maintain two men in the town, a mutual understanding is gradually brought about by which the prices of goods sold are worked back to the basis of 20 per cent gross profit, but the false price of eggs serves to draw trade from neighboring towns, and is maintained at the higher level.

As a matter of fact the price paid to farmers for eggs by the general stores of the Mississippi Valley is frequently 1 to 2 cents above the price at which the storekeeper sells the product. Allowing the cost of handling, we have a condition prevailing in which the merchant is handling eggs at from 5 to 10 per cent loss, and it stands to reason that he is making up the loss by adding to the prices of his goods.



Some of the effects of this system are:

1. The inflated price of merchandise is an injustice to the townspeople and to farmers not selling produce; in fact, it amounts to a taxation of these people for the benefit of the egg producers.

2. The inflated prices of the merchant's wares work to his own disadvantage in competition with mail-order or out-of-town trade.

3. The farmer who exchanges eggs for dry goods is not being paid more for his eggs, save as the tax on the townspeople contributes a little to that end, but is in the main merely exchanging more dollars.

4. The use of eggs as a drawing card for trade works in favor of inferior produce, and the loss to the farmer through the lowering of prices thus caused is much greater than his gain through the forced contributions of his neighbors.

#### DELAY IN MOVING EGGS.

The delay which takes place from the time the eggs are produced on the farm until they reach the packing house or car-lot shipper is a direct result of the case-count system of buying. This delay is most serious, and, coupled with weather conditions, it is responsible for the changes occurring and the loss and deterioration caused. Incidental to the delay and the ignoring of the necessity for good quality, many careless habits develop in handling the eggs. On the farm this usually takes the form of negligence in gathering the eggs, also in storing them in hot, damp, or other unsuitable places, and in holding them for a considerable length of time, either because it is not convenient to go to town or, in the fall on a rising market, with the idea of getting a better price. At the country store, also, the eggs are often held for a considerable length of time. When the eggs finally reach the packer they may, therefore, be several weeks old, and as they are subjected to high temperature during the summer and early fall months, and may have been held in damp places, changes often take place which bring them under one or other of the following well-recognized classes.

#### CLASSES OF DETERIORATED EGGS.

##### HEATED EGGS.

Heated eggs occur most commonly, of course, during the summer months. They are caused by the development of the embryo in fertile eggs. Whenever a fertile egg is subjected to proper conditions of heat and moisture, whether it be under a hen, in a bucket behind the kitchen range, or in an egg case in the hot sun on the railroad station platform, the embryo development proceeds. The degree to which this development has progressed will determine into which of the classes or grades recognized by practical egg men it will fall. "Light floats" are those in which there is only a slight development, approximately equal to that reached at the end of 18 or 24 hours of

natural incubation. Usually this development would go unnoticed when the egg is broken. "Heavy floats" show a greater development, usually sufficient to be noticed on breaking. "Blood rings" are characterized by the appearance of a ring of blood next to the shell membrane. In these eggs the developing embryo has died, and the peripheral blood vessel has adhered to the membrane and is plainly visible before the candle. In other cases the development proceeds until the growing chick is visible before the candle. Many of the eggs that contain well-developed chicks are classed as rots. In exceptional cases the development may proceed until the egg actually hatches in the egg case or wherever else it may be.

#### HELD OR SHRUNKEN EGGS.

The contents of a fresh-laid egg completely fill it, but as the egg cools the contents shrink slightly, causing a small bubble or air cell to appear at the large end. As the egg grows older the water is continually evaporating from the white through the shell membrane and the shell, and this causes the air cell in the large end of the egg to increase in size. Such an egg is characterized as held, or shrunken. The rapidity with which this evaporation and shrinking progresses depends, of course, upon the humidity of the air surrounding the egg. Shrunken eggs are most common during the fall and early winter, when the price of eggs is rising. At this time both the farmer and the storekeeper are often guilty of holding eggs in the hope that the price will have advanced by the time they are ready to sell. Needless to say, they largely defeat themselves, for buyers have learned to anticipate this condition, and consequently depress the price below what it would otherwise be.

#### ROTS.

A number of different kinds of rots are recognized by the trade, but the two most common classes are those known as black or mixed rots and as spot rots or spots. The black rot is often caused by bacterial growth. These eggs appear dark or black before the candle and are characterized on breaking by a most offensive odor. In the case of spot rots, the bacterial growth has remained localized and shows as a spot or patch next the shell and usually attached to it. These are easily detected on candling. Spots are also often caused by the development of molds.

#### DIRTY EGGS.

Many eggs are soiled and dirty. These are caused by dirty nests, thus allowing the eggs to be soiled by droppings, by dirt from the feet of the fowls, particularly during rainy weather, and by smearing with the contents of broken or cracked eggs.

## BROKEN EGGS.

Many eggs are cracked or broken before reaching the packing house. Those cracked only slightly, so that the egg contents do not leak out, are known as "checks." Those in which the egg contents are leaking or have partially leaked away are known as "leakers." Broken or "checked" eggs depreciate rapidly and must, therefore, be separated out and sold for immediate consumption at a reduced price or they must be dried or broken out in cans and frozen.

## OTHER DETERIORATED EGGS.

As eggs are very prone to take on the taste and odor of their surroundings, a considerable number deteriorate in this respect. If stored in damp cellars, they are likely to develop a musty flavor which is practically impossible to detect without tasting. Other flavors caused by storing with vegetables, such as onions, are common.

## METHODS USED FOR THE IMPROVEMENT OF THE FARM EGG.

In attacking this problem the bureau concentrated its efforts upon those measures which were considered the most important and gave promise of accomplishing the most good. The two main lines were: First, the encouragement of the loss-off system of buying, and second, a close and careful examination of the conditions surrounding the marketing of eggs all the way from the producer to the packing house. The State of Kansas was selected as a working base for three reasons: First, the output of eggs is enormous, but the quality has usually been low. Second, the buyers of the State had already made at least one attempt to enforce the loss-off system of buying, which indicated a receptive spirit on their part. Third, the statutes of Kansas contain provisions giving the State board of health abundant authority to prevent the sale of bad eggs within the State.

The first attempt, above alluded to, of enforcing the loss-off system of buying failed because the buyers along the borders of the State met competition from adjacent States where the case-count system was in operation and, becoming discouraged, in self-defense resorted again to the case-count system. The other buyers of the State in turn felt compelled to return to the case-count basis, and the entire agreement soon fell to pieces.

## ORGANIZATION OF BUYERS.

The first step, therefore, was to get the buyers together. With the cooperation of officers of the State board of health and the Kansas State Agricultural College, a meeting of the Kansas Egg Shippers' Association was held at Topeka on June 10, 1910.

where an agreement was entered into to buy strictly on a loss-off basis after July 1, 1910.

The proceedings of the meeting resulted in the adoption of the following resolutions:

First. That Dr. Crumbine have cards and circulars printed and mailed to every merchant that handles eggs in the State of Kansas, the association bearing the expense.

Second. That buyers send out circulars to their patrons, through their offices, relative to their attitude on the marketing of eggs.

Third. The term designating loss-off includes all rots, spots, blood rings, and leakers.

Fourth. That Dr. Crumbine and G. C. Bowman shall draft and have printed circulars to be sent to shippers for distributing to their patrons.

Fifth. That buying on a loss-off basis shall commence July 1, 1910.

Sixth. That the members of the association shall sign the following agreement:

"We the undersigned egg shippers, hereby agree that from and after July 1, 1910, we will buy all eggs loss-off, said loss-off to include all rots, spots, blood rings, and leakers."

The following circular was drafted and mailed by members of the association to the dealers throughout the State from whom they drew their supplies.

#### TO OUR PATRONS.

The prices current on Kansas eggs on the eastern market indicate that the Kansas egg has a "bad name." This deplorable condition is the natural and inevitable result of buying and shipping eggs by the "case-count" system, or, as one man graphically expressed the situation, "everything with a shell goes in Kansas." This lowered price of the Kansas product means a great loss to the producers and buyers of a wholesome article, which can never be remedied until the egg unfit for food is eliminated from the channels of trade. It is the belief of those who are in a position to know that the value of the egg product of Kansas would be increased approximately \$1,000,000 annually if proper care is taken of the product by the farmer and merchant.

An egg that will grade a first or extra when delivered by the farmer will rapidly deteriorate into a second or even a third if held for only a short time during the heat of summer. Therefore, the farmer should gather his eggs at least twice a day, put them in a cool place, and deliver them to the merchant at least every second day, and the merchant in turn ship daily during the hot season.

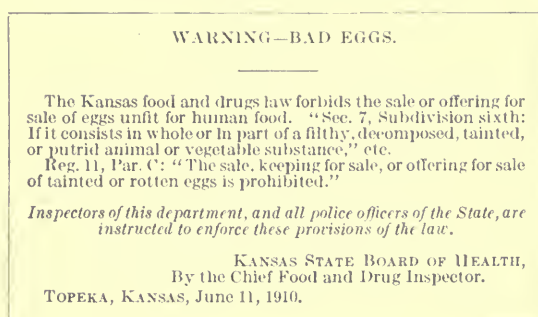
We desire also to call your attention to the fact that the Government has shown considerable activity of late in the seizure of the eggs entering into interstate commerce which have not complied with the national food and drug law in that there were many of them unfit for food.

The State authorities, cooperating with the Federal Government, are insisting that the sale of eggs unfit for food shall cease. There is only one method of bringing about the results above indicated; namely, that of buying "loss off." By putting into action the above suggestions, in handling and carefully candling, it has been agreed that beginning July 1, 1910, all eggs shall be purchased on the "loss-off" basis.

We want every merchant to cooperate with us by candling all eggs and ship them daily, and further, instruct the producers to gather eggs at least twice a day, put them in a cool place, and market them every other day.

## COOPERATION OF STATE OFFICIALS.

Profiting by the failure of the former attempt to bring about the loss-off system of buying, the support of the State board of health was early enlisted in the cause. This was an important step, without which the movement would have met the same fate as its predecessors, for the activity of the State board of health served to keep wavering buyers in line through fear of prosecution for handling bad eggs. It is a pleasure to state that the secretary of the board, Dr. S. J. Crumbine, was most active in supporting the movement and lent the force of his department to its successful operation. Placards (as below) were printed and posted in about 3,000 stores throughout the State where eggs were bought or sold.



## INVESTIGATION OF CONDITIONS SURROUNDING THE EGG INDUSTRY.

After the above buying agreement had been accomplished, and the assistance of the State authorities assured, the efforts of the bureau were at once directed to a comprehensive study of the conditions in the field and a campaign of education was immediately begun among the Kansas farmers. The following account of the methods used in making this study may serve as a guide to similar work which may be undertaken in other States.

As the first step, a packing house was selected whose manager was in sympathy with and believed in the practical good to be accomplished by such a study. The association with such a packing house made it possible to investigate shipments of eggs, whenever desired, from their origin on the farm, and to observe the changes which might occur. By virtue of enjoying the confidence and friendship of the manager, it was also possible to get into touch with some of the smaller buyers and stores shipping eggs to him. Through these buyers and storekeepers it was again possible to make the acquaintance and secure the confidence of the farmers furnishing them with eggs. Thus a complete chain was established from the farm to the



packing house, all parts of which had a direct interest in the egg business, and all of which were willing to give the bureau any help possible. The conditions found as a result of these studies are given in the following section.

#### CONDITIONS ON THE FARM.

The writers made personal visits to more than 100 farms during the summer of 1910, driving more than 1,000 miles over the country roads. Detailed records are available for 92 of these farms. In assembling the information secured the card shown below was used.

[Front of card.]

[UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ANIMAL INDUSTRY.]

#### POULTRY AND EGG MARKETING INVESTIGATIONS.

FARMER'S CARD.

Name _____	No. _____
Address _____	
Date _____	
Character of farm:	
Size _____	
Crops raised _____	
Stock kept _____	
Poultry accommodations:	
Houses—	
Kind _____	
Number _____	
Location _____	
Nests—	
Kind _____	
Number _____	
Location _____	
Runs—	
Size _____	
Number _____	
Treatment _____	
Poultry kept:	
Variety _____	
Number—	
Males _____	
Females _____	
Ages _____	
Natural or artificial incubation _____	
Natural or artificial brooding _____	
Egg production:	
Weight of eggs per dozen _____	
Method of feeding _____	
Rations _____	
Gathering eggs:	
Frequency _____	
By whom _____	
In what _____	
Keeping eggs for market:	
Where _____	
How long _____	
Temperature _____	
How marketed _____	
Distance from market _____	
Name and address of person or firm to whom sold _____	

[Back of card.]

## SCORE CARD OF FARM POULTRY FLOCK.

Equipment.	Score.		Methods.	Score.	
	Perfect.	Allowed.		Perfect.	Allowed.
POULTRY STOCK.			FEEDING.		
Health.....	10	.....	Water: Clean, fresh, abundant..	3	.....
Vigor.....	10	.....	Variety of feed.....	5	.....
Pure breeding.....	5	.....	Green feed.....	2	.....
Age.....	3	.....	In winter and at other		
All in first or not over half			times when not available.		
in second laying year necessary			Meat feed, wholesome.....	3	.....
for perfect score.			Grit.....	1	.....
HOUSES.			Shell.....	1	.....
Location.....	7	.....	Fresh feed, not sloppy or sour..	1	.....
Well drained.....	5	.....	Sound feed.....	1	.....
Southern or southeastern			HANDLING EGGS.		
exposure.....	2	.....	Gathering: Once daily, twice in		
Construction.....	5	.....	hot weather.....	3	.....
Tight back wall, ends,			Keeping eggs.....	4	.....
and roof.....	1	.....	Cool, 50° to 70° F.....	1	.....
Dry floor.....	2	.....	Dry, to prevent mold.....	1	.....
Economy.....	1	.....	Free from contamination		
Location and shape of			of taste or odor.....	1	.....
windows.....	1	.....	Clean surroundings.....	1	.....
Light.....	3	.....	Frequency of marketing.....	3	.....
One square foot of glass to			Daily.....	3	.....
12-16 floor space or 1 square			Semiweekly.....	2	.....
foot of glass, and 1 square			Weekly.....	1	.....
foot of cloth to 25 feet floor			Less often.....	0	.....
space.			Grading out odd-sized, dirty,		
Ventilation.....	3	.....	washed, cracked, and doubtful		
Open front or curtain			eggs for home use.....	4	.....
front.....	3	.....	Separation of males from females		
Adjustable windows.....	2	.....	during warm weather		
Floor space.....	3	.....	after breeding season.....	3	.....
4.5 to 6 square feet per hen.					
3.5 to 4.5 square feet per					
hen.....	2	.....			
2.5 to 3.5 square feet per					
hen.....	1	.....			
Less than 2.5 square feet					
per hen.....	0	.....			
Convenience.....	1	.....			
Nests.....	1	.....			
1 to 5 hens.					
Cleanliness.....	5	.....			
Frequent removal of drop-					
pings.....	2	.....			
Nests.....	2	.....			
Walls, windows, etc.....	1	.....			
RUNS OR RANGE.					
Square feet per bird.....	3	.....			
100 to 200 square feet.....	3	.....			
50 to 100 square feet.....	2	.....			
Less than 50 square feet.....	1	.....			
No run.....	0	.....			
Cultivation.....	4	.....			
Drainage.....	2	.....			
Shade.....	1	.....			
Total.....	66	.....	Total.....	34	.....

Equipment..... Methods..... Final Score.

This card was found to be a most convenient method of tabulating and preserving the data secured from individual farms. The score card on the back served to make comparison easy by placing a numerical value on the poultry equipment and methods.

Before entering into the discussion relating to the poultry conditions on the farm, it might be well to give a brief description of the

size and general character of the farms which were visited. As to size, there are in Kansas the smaller farms containing from 60 to 300 acres and also those which are several thousand acres in extent, the latter being used for the most part as pasture and grain land, while on the former diversified farming is the usual practice. The principal crops raised are corn, wheat, oats, barley, kafir corn, millet, sorghum, potatoes, and hay. The term "hay" would include many varieties of cultivated grasses and legumes, and of these alfalfa is by far the most important crop. The classes of live stock which are raised extensively are horses, beef cattle, milch cows, sheep, and hogs, beef cattle and hogs being in the majority. The large farms, or ranges, do not as a rule have any great number of poultry on them, and consequently play a small part in the present discussion. From this general description it is easy to understand why poultry forms an important part in the agricultural wealth of this section of the country, since grain and other desirable feed, including alfalfa, are abundantly and economically raised, and the soil and climatic conditions are well suited to the production of poultry. The details of the 92 farms previously referred to in regard to acreage and size of flocks are as follows:

TABLE 3.—*Relation of size of farm to number of hens kept, based upon 92 Kansas farms.*

Size of farm.	Number.	Total acreage.	Average acreage.	Total number of hens.	Average number of hens.	Hens per acre.
80 acres or less.....	18	1,440	80.0	1,998	111.0	1.39
81 to 160 acres.....	45	6,514	144.7	5,401	120.0	.83
161 to 240 acres.....	18	3,828	212.7	2,190	121.7	.57
Over 240 acres.....	11	3,805	345.9	1,680	152.7	.44
Total.....	92	15,587	169.4	11,269	122.5	.72

#### THE POULTRY STOCK.

The value of purebred poultry has not been realized to as great an extent by the farmers of Kansas as it should be. The bulk of the poultry on the farms are what are commonly known as mongrel or dunghill fowls. When any breeding is apparent Barred Plymouth Rock and Leghorn characteristics predominate. A small proportion of the farmers, however, do keep some purebred poultry. In Plate I is shown a view of a good farm flock of Rose Comb Rhode Island Reds. The breed most popular among farmers is the Barred Plymouth Rock.

Improvement is usually sought by bringing in fresh blood every two or three years in the form of a new male bird, generally of a different breed each time. About the only visible effect of this spasmodic scheme is to add yet greater dissimilarity to the already won-



derfully variegated flock. If the farmer would carefully select 10 or 12 of his best females each year and mate them with a purebred male which conformed to the general character of the females, adhering always to the same breed, he could in the course of a few years make a marked improvement in his flock.

The introduction of Leghorn blood (and many farm flocks show some trace of Leghorn blood) has had a marked tendency to decrease the size of the average farm fowl in Kansas. This point was forcibly demonstrated to the authors by observing the weights of many thousands of birds in the large packing houses, and also by weighing eggs from the flocks of all the farms visited. These observations showed that the average weight of hens on the farm ranged from  $2\frac{1}{2}$  to 4 pounds, and the average weight of eggs per dozen was 23 ounces. At a glance it is quite evident that the weight of the mature fowls is very much lower than it should be, and observations have shown that the average weight of a dozen eggs from purebred stock does not fall below 24 ounces. The standard weights of the popular general-purpose breeds are given below:

Plymouth Rocks (6 varieties): Hen,  $7\frac{1}{2}$  pounds; cock,  $9\frac{1}{2}$  pounds.

Wyandottes (8 varieties): Hen,  $6\frac{1}{2}$  pounds; cock,  $8\frac{1}{2}$  pounds.

Orpingtons (3 varieties): Hen 8 pounds; cock, 10 pounds.

Rhode Island Reds (2 varieties): Hen,  $6\frac{1}{2}$  pounds; cock,  $8\frac{1}{2}$  pounds.

While it is quite evident that the stock on the farms in this section is undersized, and that the eggs are smaller than those of purebreds, it is satisfactory to note that there is a tendency at the present time to improve this inferior stock or discard it entirely by purchasing eggs or stock of some breeder who handles a pure breed of the general-purpose type. One of the reasons for this change is that many of the large packing houses are offering 2 to 3 cents more per pound for market fowls of the heavier breeds than they are for the Mediterranean or lighter breeds. The following table shows the breeds of poultry kept on the 92 farms where detailed studies were made, and the relative proportion of purebred flocks and flocks of mixed breeding:

TABLE 4.—*Breeding of chickens kept on 92 Kansas farms.*

Purebred flocks.			Flocks of mixed breeding.		
Breed.	Number of farms.	Per cent of total.	Breed predominating.	Number of farms.	Per cent of total.
Plymouth Rock.....	4	4.3	Plymouth Rock.....	41	47.8
Leghorn.....	5	5.4	Leghorn.....	13	14.1
Rhode Island Red.....	2	2.2	Rhode Island Red.....	4	4.3
Orpington.....	1	1.1	Orpington.....	4	4.3
Wyandotte.....	4	4.3	Wyandotte.....	2	2.2
Langshan.....	2	2.2	Brahma.....	2	2.2
			Minorca.....	1	1.1
			Plain mixed.....	4	4.3
Total.....	18	19.5	Total.....	74	80.3

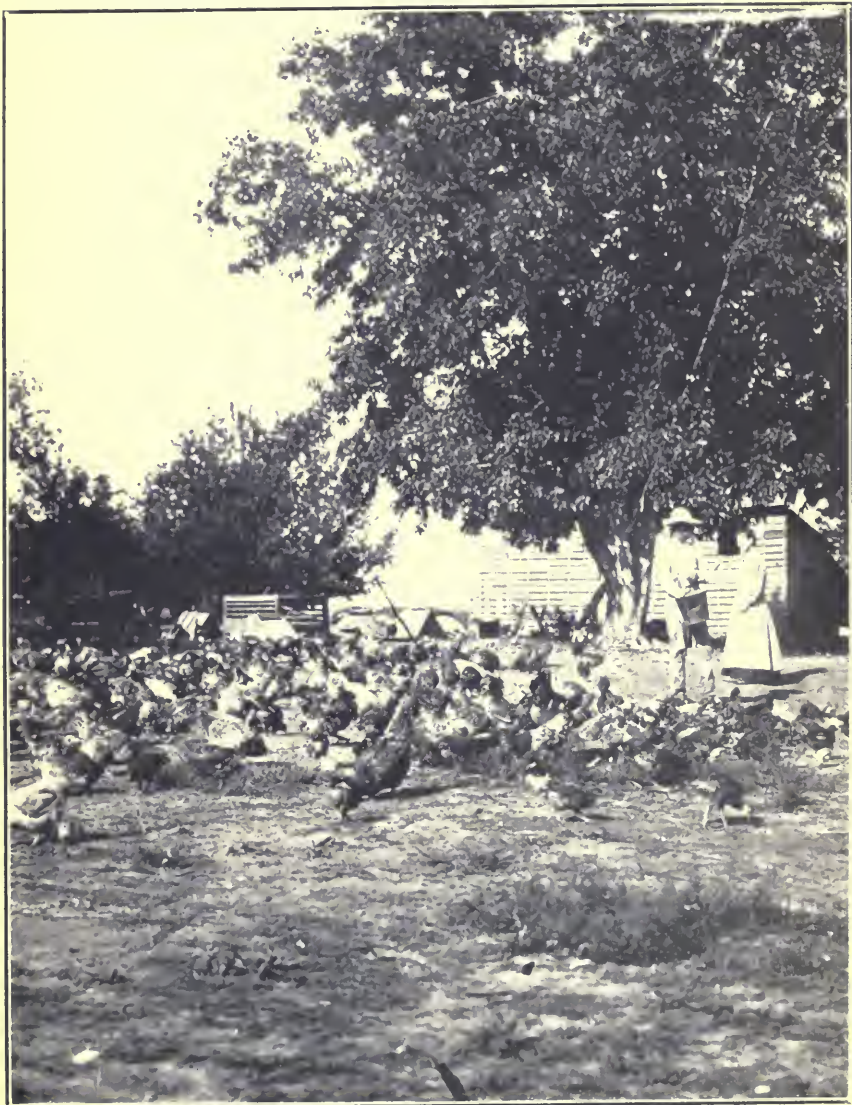
## POULTRY BUILDINGS.

The majority of the farm poultry buildings are either poorly constructed for the purpose, or were buildings which had formerly been used for other purposes. There is little indication of any special effort on the part of the farmer to provide clean comfortable quarters for his fowls. He seems to take it for granted that the fowls, unlike the horses and cattle and other live stock, do not require comfortable quarters in order to be profitably maintained. In this assumption he is partially correct, for where there is very little investment and a more or less regular income he is sure to realize some profit. It is, in fact, almost impossible to neglect fowls to such an extent that they are maintained at a loss under such conditions. Even in instances where the farm flock is compelled to roost in the trees throughout the entire year, and forage for the greater part of their feed, some profit is usually realized. All this is true because the fowls, on account of this hardy outdoor existence, are as a rule in excellent health and produce enough eggs in the spring and summer months to return a reasonable profit to the farmer.

Views are reproduced in the upper portion of Plate II, showing two extreme types of poultry houses, the one poorly and the other well constructed. Both houses provide comfortable quarters for the fowls in so far as protection from the weather is concerned, but when we consider the question of eradicating disease, lice, or mites, the building shown in figure 1 presents a difficult problem. It is true that for all practical purposes the building in figure 2 does not afford any better protection from the weather elements than the inferior house, but the material and workmanship is such that diseases and vermin can be successfully combated. The most serious objection to this house is that it is a more expensive structure than many farmers would care to erect. There is, however, no necessity for going to one extreme or the other, and in figure 3 is shown what can rightly be called a happy medium. This house combines the good points of both the others, and the material and workmanship is such that it is as easy to keep in a sanitary condition as the more expensive house.

## CLEANLINESS AND VENTILATION.

A not uncommon practice on Kansas farms is to clean the poultry house only once or twice a year and the result is that many of the houses are in a very filthy condition. The accumulation of filth and droppings on the floor of the poultry houses, 95 per cent of which have dirt floors, opens the way for the invasion of many infectious diseases, and the droppings from one sick fowl may be the means of infecting the entire flock. In one or two instances the houses were equipped with a dropping board under the roosts. This practice is



A FARM FLOCK OF RHODE ISLAND RED CHICKENS.



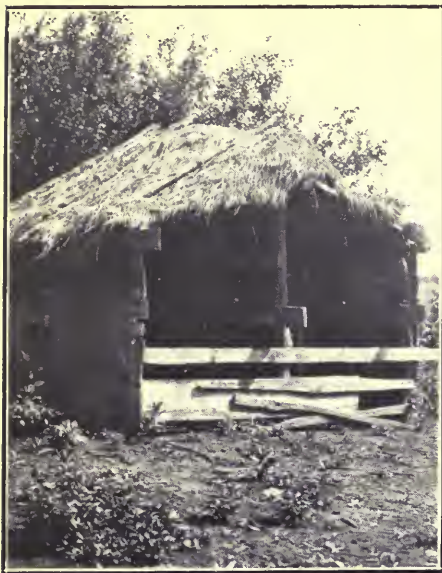


FIG. 1.—A CRUDELY CONSTRUCTED POULTRY HOUSE.



FIG. 2.—A WELL-CONSTRUCTED POULTRY HOUSE.

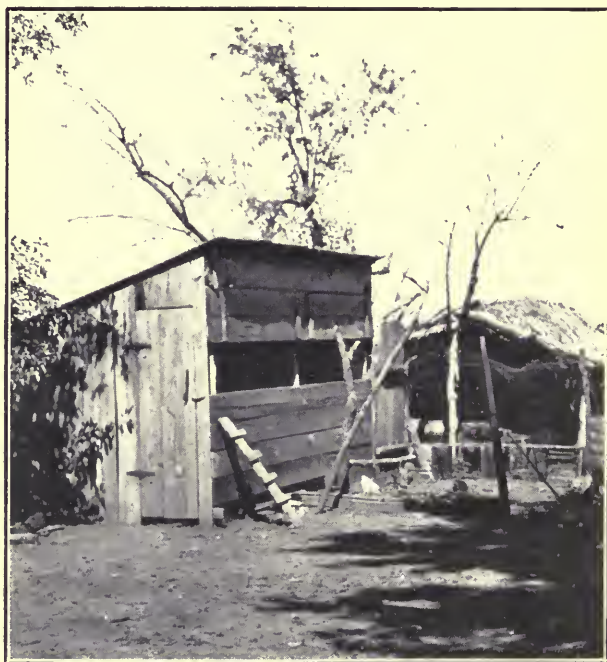


FIG. 3.—AN INEXPENSIVE PRACTICAL FARM POULTRY HOUSE.

to be highly commended, since it prevents the accumulation of droppings on the floor, and also makes it easy to remove them.

No special attention was given to supplying the fowls with a liberal amount of fresh air, but because the majority of the houses are of crude construction, and also by means of small windows, doors, and numerous cracks and openings the fowls suffered little from the lack of ventilation. In relation to the amount of floor space per bird, it is a common occurrence to find from 75 to 100 fowls housed in a building of such dimensions that it allows each fowl only about 1 square foot of floor space, and it was easy to find cases where even less space than this was provided. However, where the fowls are allowed free range on all suitable days, and the house is cleaned at frequent intervals, the question of a definite amount of floor space per bird is not very important.

The farmer of the Middle West seldom, if ever, confines his poultry in yards, and there is no doubt that this has been a most important factor in maintaining the vigor and health of the fowls so admirably. The condition of the farm flocks in respect to these two qualities is well shown by the following figures from the 92 farms:

TABLE 5.—*Health and vigor of poultry flocks on 92 Kansas farms.*

Health.			Vigor.		
Good.	Fair.	Poor.	Good.	Fair.	Poor.
65	19	8	67	18	7

#### FEEDING METHODS.

During the spring, summer, and fall the fowls are compelled to forage for the greater part of their living. Even during the winter months they are fortunate if they receive more than one feed a day. Consequently they are compelled to pick up a considerable portion of their living around the barn and cornerib. This condition has arisen from the practice of giving the poultry free access to the feed lots for beef cattle and hogs. In feeding the steers and hogs the corn is often dumped in piles about the feed lot, thus making it possible for the fowls to procure a liberal feed of corn at least once a day. At thrashing time also there is considerable waste grain which would be a total loss if not utilized by the poultry. The fields of alfalfa make an ideal range and furnish abundant green feed. It is quite common to see the alfalfa stack in close proximity to the barn and other outbuildings, and in this case the fowls have green feed close at hand.

Where any attempt is made to supply the fowls with grain regularly once or twice a day the following feeds are generally used: Corn, wheat, kafir corn, and spelt. Of these the one most commonly used is corn. The fowls do not receive a regular supply of meat feed, and when insects are no longer available they are compelled to exist on an unbalanced ration of starchy grains. It is, however, a common practice to give the fowls the offal from whatever butchering may be done on the farm, and often the farmer may kill jack rabbits, which are sometimes used as meat feed for the poultry. The supply of meat feed is, however, very irregular. Practically every flock examined showed more or less feather pulling, thought to be the result of an insufficient supply of this material.

Crushed clam shells are used almost exclusively to furnish the fowls with carbonate of lime. Grit in the form of commercially prepared crushed stone is seldom used, but many farmers haul a load of coarse sand to the barnyard and allow the fowls free access to it at all times. Such a method is inexpensive to the farmer and furnishes the fowls with an abundant supply of grit.

The water supply for the poultry is usually both insufficient and insanitary. Vessels of every size and description, such as oven doors, milk-can tops, wooden troughs, pails, and cans of all sizes, are used as reservoirs for water. It is the exception rather than the rule to find these vessels clean and filled with water. They are more apt to be completely dry and dirty, while the fowls can be seen drinking from a cesspool in the barnyard or a wallow in the pigpen.

#### HATCHING AND BROODING.

There are two general systems of hatching and brooding the chicks: First, hatching and brooding with hens exclusively; second, hatching the eggs in an incubator and then giving the chicks to hens. The former is practiced to a greater extent than the latter, and in many instances a combination of both is used. Where this is done it is a general practice to set a number of hens at the same time, and when the hatch comes off the chicks are divided up among them. Many chicks are produced by hens stealing their nests, and this condition is responsible for a large per cent of the immature stock that is so noticeable in the fall and early winter.

If fowls are used exclusively for hatching and rearing, it is often difficult to get the chicks out early on account of the hens' indisposition to sit. It was largely to overcome this difficulty that the incubator has been adopted on the farm. A comparison of the relative frequency with which artificial and natural methods or a combination of the two are used, both in hatching and brooding, is given in Table 6.

TABLE 6.—*Methods of incubation and brooding used on 92 Kansas farms.*

Hatching.			Brooding.		
Natural.	Artificial.	Combina- tion.	Natural.	Artificial.	Combina- tion.
54	16	22	80	3	9

The methods of feeding the chicks are for the most part very simple. Some chicks are grown on nothing but corn meal and cracked corn, and others receive only millet seed until they are large enough to consume the coarser grains. There are many farms, how-

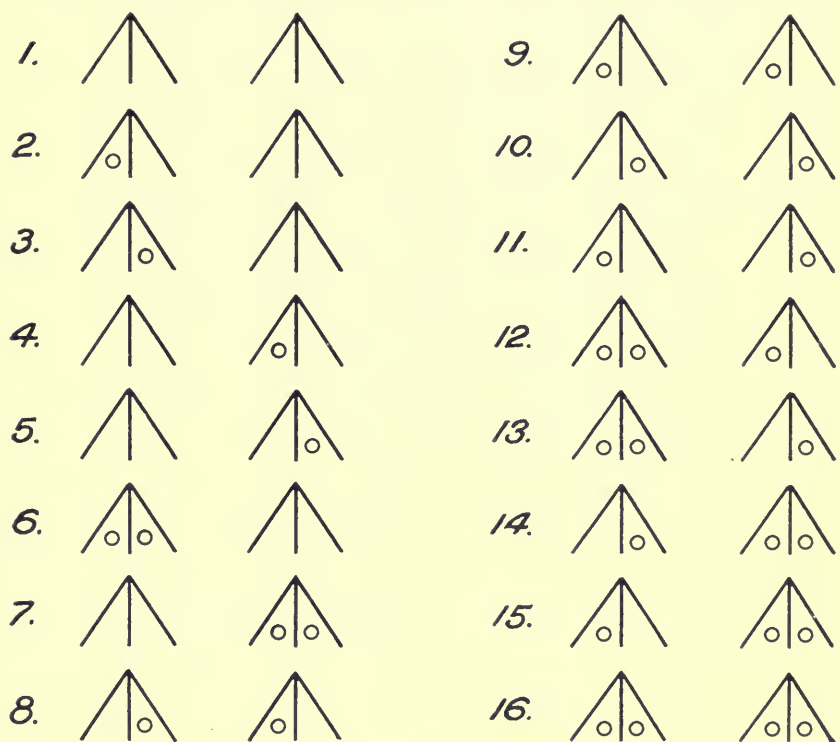


FIG. 1.—Method of toe-marking chicks to determine age. Sixteen different toe marks.

ever, where such extreme measures are not used, a happy medium being reached by using some commercial chick feed in connection with such products as are produced on the farm.

#### METHOD OF MARKING POULTRY TO DETERMINE AGE.

At the present time 95 per cent of the farmers have no positive method of determining the age of their poultry. From an economic



standpoint it is very desirable that when a farmer markets a part of his stock he should be able by some accurate method to ascertain the age of the fowls which he sells. Such a plan would tend to decrease the enormous number of pullets and yearling hens which through lack of system are now being disposed of while old hens are often retained. Yearling hens and pullets especially will in the course of the year return to the farmer a greater profit from the eggs which they produce than will the older fowls. Hens can be kept at a good profit until they have passed their second year, but they are not as a rule profitable beyond that age.

The most common method of marking poultry is to leg-band them. These bands are manufactured from aluminum, wire, and composite metals, and are placed around the leg of the fowl and fastened in numerous ways. This system, while eminently satisfactory, requires more labor and attention than most farmers would care to give. A more practical method is by punching the web of the foot at the time the chick is hatched. The operation is simple and an entire hatch can be toe-marked in a short time. Figure 1 shows a diagram of a system by which 16 different combinations of toe-marking are possible. If only one mark is employed for all chicks hatched in a given year, no farmer would find it necessary to use more than three or four of these marks, but, if it were desired to show ages more closely, or to mark pedigree stock, all the forms indicated might be found useful.

#### INSUFFICIENT NUMBER OF NESTS.

While the conditions thus far discussed surrounding the keeping of poultry on Kansas farms have a great influence upon the number and size of the eggs produced and may also have some influence upon their quality, there are other conditions which have a much more direct influence upon quality and are responsible for the greater part of the deterioration which has occurred by the time the eggs reach the country store. Among these are, insufficient number of nests, dirty nests, irregularity in gathering eggs, allowing the males to run with the flock after the hatching season, poor storing facilities, washing eggs, holding for a definite number of eggs, and careless methods of transportation from the farm to the village.

It is doubtful if any other one factor contributes more to the aggregate number of bad eggs on the farm than the lack of a sufficient number of properly located, clean nests. The average number of nests on the Kansas farms observed is 11 to every 100 hens. This means that nearly 50 per cent of the fowls are compelled to seek nests for themselves. This condition is well shown in Table 7.



TABLE 7.—*Number of nests to number of hens kept on 92 Kansas farms.*

Nests to hens.	Number of farms.	Nests to hens.	Number of farms.
No nests . . . . .	5	1 nest to 13 hens . . . . .	4
1 nest to 100 hens . . . . .	1	1 nest to 12 hens . . . . .	6
1 nest to 57 hens . . . . .	1	1 nest to 11 hens . . . . .	3
1 nest to 50 hens . . . . .	1	1 nest to 10 hens . . . . .	12
1 nest to 37 hens . . . . .	1	1 nest to 9 hens . . . . .	3
1 nest to 33 hens . . . . .	2	1 nest to 8 hens . . . . .	6
1 nest to 30 hens . . . . .	2	1 nest to 7 hens . . . . .	5
1 nest to 21 hens . . . . .	1	1 nest to 6 hens . . . . .	5
1 nest to 20 hens . . . . .	2	1 nest to 5 hens . . . . .	7
1 nest to 18 hens . . . . .	3	1 nest to 4 hens . . . . .	5
1 nest to 17 hens . . . . .	1	1 nest to 3 hens . . . . .	3
1 nest to 16 hens . . . . .	2	1 nest to 2 hens . . . . .	6
1 nest to 15 hens . . . . .	1	More than 1 nest to 1 hen . . . . .	1
1 nest to 14 hens . . . . .	3		

The horse stable, straw stack, under the cornerib, or out in the weeds are the places usually chosen by the hens when a sufficient number of nests is not available. It is well known that vigorous bacterial growth depends largely upon moisture and warmth, and these factors are usually present in such places. The result is that when a nest full of such eggs is discovered, from 50 to 80 per cent of them have already developed into seconds, blood rings, and rots.

The excuse is often given by farmers that if they went to the trouble and expense of providing liberal nesting facilities the hens would not utilize them, as they prefer the secluded nest of their own choosing. While it is true that in many instances hens will steal their nests rather than lay in places provided for them, especially during the spring which is the natural hatching season, it was observed that on the farms where nests were provided at the rate of one for every four or five hens, and were kept free from vermin, 95 per cent of the eggs were laid in these nests, and it was only occasionally that a hen would lay elsewhere.

#### DIRTY NESTS.

It hardly seems necessary to make any mention of dirty nests, but the investigations of the past year prove conclusively that either through carelessness, neglect, or utter indifference the nests often become so filthy that the hens refuse to lay in them. When such nests are used the new-laid eggs come in contact with the droppings of the fowls, which contain numerous bacteria, and the eggs may therefore become infected before they are removed from the nest. This does not necessarily mean that the eggs are unfit for food at this time; but the infection having taken place, they are likely subjects for the production of spots and rots. One of the greatest needs, therefore, in improving the condition of eggs on the farm is to provide an abundance of clean nests free from vermin.

## IRREGULARITY IN GATHERING THE EGGS.

The practice of combining forces and organizing a general search party to gather in the eggs on market day is still practiced on many of the farms in Kansas. This is indeed a deplorable custom, and there is no question but that it is the cause of many rotten eggs. It is easy to see how eggs allowed to remain for several days or a week in the unsuitable places where they may have been laid, subjected probably to high temperature, wet by dew and by rain, and perhaps sat upon by a broody hen, are certain to have undergone serious deterioration if they are not absolutely spoiled.

## MALES RUNNING WITH FLOCK AFTER HATCHING SEASON.

This is the usual rather than the unusual condition. Of the 92 farms, there were only 16 on which any effort had been made to separate the males from the hens after the hatching season, while on the remaining 76 farms the males and hens ranged together. Justification for this practice is sometimes sought in the argument that there will be some stolen nests that remain undiscovered for so long that even the conscience hardened by the case-count system of buying will not consent to their being marketed, and that if these eggs had been fertilized by allowing the males to run with the flock a part of the eggs would have hatched and the loss would not have been absolute. It should be borne in mind, however, that a much greater loss actually does occur when the eggs are fertile, for it is from the fertile eggs only that the great mass of bad and deteriorated eggs known as heated eggs, blood rings, and many of the rots develop. With the eradication of fertile eggs during the hot summer months, a large part of the problem of heated eggs would be solved. Surely this is not a difficult condition to bring about if each one would do his part.

## INEFFICIENT STORING FACILITIES.

This is a serious difficulty with which the farmer's wife has to contend, as a great many of the country homes in Kansas do not have dry, cool cellars, and when the thermometer begins to register from 100 to 106° F., there is no good place to keep perishable produce. To overcome this difficulty use is often made of the "cyclone cellar," or cave. In some instances these caves are of concrete construction throughout, and on such farms very little difficulty is experienced in keeping eggs in good condition. Some of the caves, however, are nothing more than oblong holes in the ground over which a rough gable roof is built. The soil which has been excavated to make the cave is thrown over this roof and thoroughly packed so as to make it cool and practically waterproof. Caves of such construction are very hard to keep clean on account of the dampness and mold, which are always present when dirt walls and floor are used, and conse-

quently they are very undesirable as a storage room for eggs. Dampness is conducive to the rapid development of mold and bacteria, and consequently eggs kept in these caves are much more likely to show deterioration than if they were held in a dry room at the same temperature.

#### WASHING EGGS.

The lack of the necessary number of clean nests and irregularity in gathering eggs, especially on rainy days, are the two main reasons why it is often necessary for the farmer's wife to wash part of the eggs. No one would ever accuse a neat housewife of taking dirty eggs to town, and in order to maintain this reputation they are very careful to see that each egg is clean before packing it in the case. This practice, while not always harmful, often results in the egg becoming contaminated with some form of micro-organism. The eggshell itself is porous and not germ proof, and the pores are large enough to allow the invasion of moisture and bacteria, but the membrane beneath the shell is comparatively germ proof so long as it remains dry; hence it is desirable that the eggs be clean in the first place, so that water will not have to be brought in contact with them.

#### HOLDING EGGS UNTIL A QUANTITY HAS ACCUMULATED.

The farmer often makes use of an egg case in which to keep his eggs and carry them to market. Sometimes he owns the case and sometimes it is furnished him by the storekeeper. Often the case is one holding 30 dozen eggs, and there is a tendency to wait until it is filled before taking it to market. As this would take considerable time with the average-sized flock, the quality of the eggs will have suffered appreciably. Smaller cases, holding 12 dozen eggs, are also used for this purpose and are much to be preferred, as they encourage more frequent marketing. Another factor which influences the frequency of marketing is the distance of the farm from the village or country store. The greater the distance the less often are the trips made and consequently the less convenient it is to market eggs frequently. Table 8 indicates this tendency.

TABLE 8.—*Distance from market in relation to frequency of marketing eggs on 90<sup>1</sup> Kansas farms.*

Twice weekly.		Weekly.		Once in two weeks.	
Number of farms.	Average distance to market.	Number of farms.	Average distance to market.	Number of farms.	Average distance to market.
26	Miles. 2.48	61	Miles. 4.12	3	Miles. 8.5

<sup>1</sup> The two farms not included in this table did not send eggs to market during a large part of the year. In one case the eggs were used at home while in the other they were sold for hatching.

## CARELESS METHODS OF TRANSPORTATION FROM FARM TO VILLAGE.

While this element of egg deterioration does not cause a marked loss or change in itself, because it occupies a relatively brief time, it is nevertheless a contributing factor. In figure 1 of Plate IV is shown a picture of the farmer and his family on their way to market. This particular drive was one of 8 miles and the egg case was exposed to the sun's rays during the entire trip. At the time the picture was taken the thermometer registered 106° F. on the top of the egg case.

## THE FARMER'S MARKET.

The farmer may market his eggs through any one of the following agencies: (1) The country store; (2) the cash buyer; (3) the huckster; and (4) the cooperative creamery. Of these four outlets the country store is by far the most important. The reason why this system is so universal, together with the effect it has on the quality of the eggs, have already been discussed (see p. 14).

## PRESENT FEATURES OF STORE DEALING.

Under the present system of buying loss-off, or on a quality basis, many of the storekeepers in Kansas have relinquished the handling of farm eggs. This is due in part to the fact that the merchant does not feel that he can go to the expense and trouble of candling, and also to the fact that if in defiance of the pure-food laws of the State he attempts to continue on the case-count basis, at the same time offering as much as his competitors who are buying on the loss-off basis, he is experiencing a much heavier loss on his eggs than formerly. If he does not offer as much as his competitors he is likely to get only the most undesirable class of eggs, which will increase his loss still more. What this loss may amount to in a single week will be seen from Table 9. The figures given were secured from one of the carlot shippers and taken direct from the report of his candlers.

TABLE 9.—*Candler's report, showing losses in eggs received during one week in August, 1910.*

Shipper.	Total receipts.	Firsts.	Seconds.	Rots.	Loss from seconds at 6 cents per dozen.	Loss from rots at 15 cents per dozen.	Total loss.
	<i>Dozen.</i>	<i>Dozen.</i>	<i>Dozen.</i>	<i>Dozen.</i>			
Merchant A.....	180	106½	25	48½	\$1. 50	\$7. 28	\$8. 78
Merchant B.....	300	142	40	118	2. 40	17. 70	20. 10
Merchant C.....	450	280	38	132	2. 28	19. 80	22. 08
Total.....	930	528½	103	298½	6. 18	44. 78	50. 96

In buying on the loss-off basis, the storekeeper would in all probability have made no distinction between the firsts and seconds, but

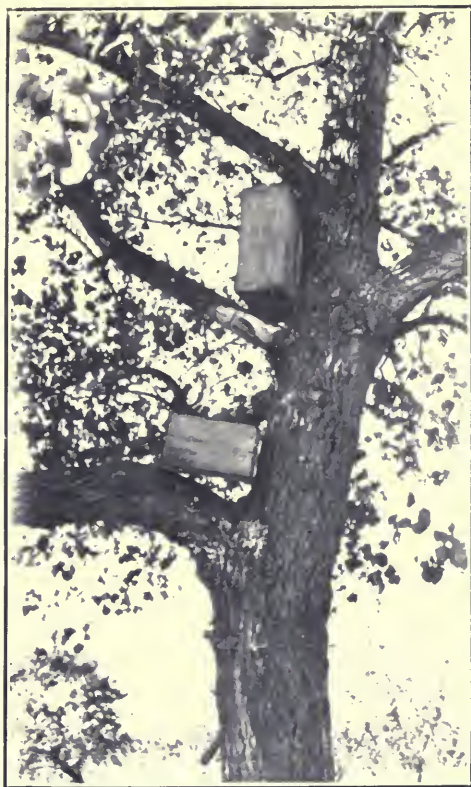


FIG. 1.—TREE NESTS, WHERE SOME KANSAS HENS LAY.

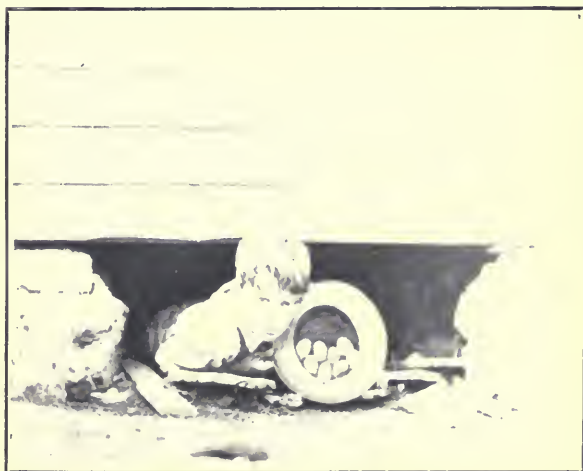


FIG. 2.—GATHERING EGGS FROM UNDER THE CORNCRIB.





FIG. 1.—TAKING EGGS TO MARKET. EGG CASE EXPOSED TO SUN'S RAYS DURING 8-MILE DRIVE AT TEMPERATURE OF 106° F.

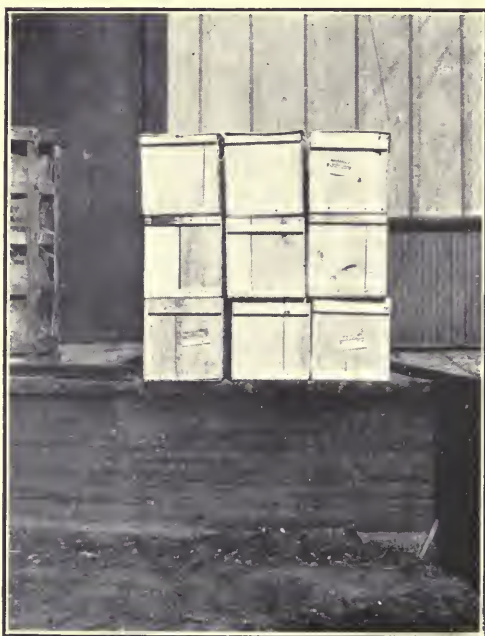


FIG. 2.—A SHIPMENT OF EGGS ON RAILROAD PLATFORM AWAITING ARRIVAL OF LOCAL FREIGHT.

[These cases stood in the sun for 6 hours in a temperature ranging from 110° to 130° F.]

would simply have thrown out the rots. The loss represented by the rots would, however, have been saved, excepting a small proportion which would have developed between the times the storekeeper and the candler handled the eggs.

Driving the local merchant out of the egg business is not inevitable, though in many respects it would be greatly to his advantage and to the advantage of the egg trade. Indeed, the merchants of some towns have voluntarily withdrawn by mutually agreeing to turn the egg trade over to the cash buyer, where it belongs. This is the simplest and best solution of the problem. It has also been suggested that the business be turned over to the produce dealer, who, instead of paying cash, shall issue scrip which will be taken at its face value in payment for goods at any of the local stores. The whole object of this plan is to compel the farmer to patronize home trade.

Other plans have been devised and are working with some degree of success which attempt to keep the benefits of the egg trade for the merchant, while at the same time relieving him of its unpleasant features. One of these allows the farmer to trade his eggs out on a case-count basis as before, but these eggs are kept separate. Each morning the receipts of the previous day are sold to the local cash buyer, who candles the eggs and reports the rots or bad eggs found in each individual lot. The merchant then charges the loss against the farmer's account and deducts it from the next lot of eggs brought in if he has no balance in his favor. By such a procedure the merchant is obeying the law, is helping to improve the quality of the eggs, is protecting himself against loss, and at the same time is retaining his egg trade. This means that instead of unloading inferior merchandise upon his customers, as he did when the case-count system was in vogue, he is able to give them full value for their money. He has no loss to figure and need not fear the competition of his fellow merchants or the large out of town mail-order houses. As soon as the farmer is made to realize that every merchant in town is going to candle his eggs, he immediately commences to take better care of them and carefully compares the prices on various articles of food and clothing as advertised by the merchants. Thus the whole problem simply resolves itself into the question of legitimate profits, and unless the merchant is selfish or money mad there is no logical reason why his prices can not be made as attractive as those of his competitors.

Aside from the method of buying, there are other conditions connected with the country store which should be remedied in order to give best results. The most prominent of these is infrequency in shipping. It is not uncommon for the storekeeper to allow his eggs to accumulate for a week or even longer before he ships them, and as

he has no room specially equipped for holding eggs and must depend upon using the back part of his store or a cellar, this is a serious cause of deterioration. The produce dealer, on the other hand, understands better the necessity for moving the eggs as quickly as possible, and not infrequently ships daily during hot weather. Under such conditions little of the deterioration occurring can be laid at his door. In the country store it was frequently observed that the egg cases were piled alongside of merchandise of many kinds, among them barrels of kerosene, barrels and crates of vegetables, and other materials from which the eggs were almost certain to absorb undesirable flavors or odors.

#### THE CASH BUYER.

The cash buyer or produce dealer may be in business for himself or may be the agent of some large car-lot shipper, or creamery company. His method of doing business is very similar to that of the country merchant, except that he offers cash instead of merchandise. He is often not looked upon with favor by the town merchants, because they realize that the farmer prefers the cash in order that he may purchase his merchandise from the firm offering the lowest prices. As long as the merchants were able to dispose of their eggs on a case-count basis they could, by offering 1 or 2 cents more per dozen in merchandise, retain the greater part of their trade. The enforcement of the loss-off system, however, is working a slow but sure change in this system and a greater proportion of the trade is going over to the cash buyer.

In studying the conditions found at the country store and at the cash buyer's the following card was used. This card is self-explanatory.

[UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ANIMAL INDUSTRY.]

#### POULTRY AND EGG-MARKETING INVESTIGATIONS.

##### COUNTRY STORE OR PRODUCE DEALER'S CARD.

Name _____	No. _____
Address _____	
Date _____	
Sources of supply _____	
Relative proportion from each source _____	
Frequency of receipts _____	
Character of payments _____	
Grading _____	
Methods of holding :	
Containers _____	
Repacking _____	
Nature of storeroom _____	
Capacity of storeroom _____	
Temperature of storeroom _____	
Length of time held _____	
How shipped _____	
Size of shipment _____	



Frequency of shipping-----  
 Distance from store to shipping point-----  
 Length of railroad haul-----  
 Time consumed in haul-----  
 Outlet -----  
 Name and address of person or firm to whom sold-----  
 -----

## THE HUCKSTER.

The huckster or peddler who gathers eggs directly from the farm is rarely found in Kansas. This system is practiced in the States of Michigan, Indiana, Ohio, Kentucky, Tennessee, and the North-eastern States. Where the huckster operates in thickly settled localities and where it is possible to have a twice or thrice a week service, the eggs gathered by him constitute some of the best on the market, but where he makes a trip of a week or 10 days the eggs are exposed to many unfavorable conditions and are usually poor in quality.

## THE COOPERATIVE CREAMERY.

The number of cooperative creameries handling eggs is not at the present time large. There are some places where this system is working successfully, and it is suggested as a feasible proposition in localities where conditions are favorable. The chief requisites necessary to operate such a system successfully are: (1) A well-established creamery whose manager is interested in the welfare and advancement of the community and who has by his straightforward dealings gained the confidence of the farmers. (2) A locality thickly enough settled to supply the creamery with sufficient eggs to maintain a trade in some near-by city. (3) A receptive and progressive body of farmers who will carry out their part of the agreement with the creamery. (4) A system of gathering up the cream and eggs by the creamery wagons or their delivery by the farmers at frequent and regular intervals. (5) A system of payment which shall, like the loss-off system, make each producer responsible for the quality of the eggs. (6) A market within easy shipping distance demanding good dependable eggs and willing to pay a premium for them. For a more detailed discussion of this subject the reader is referred to an article which appeared in the Twenty-sixth Annual Report of the Bureau of Animal Industry entitled "Marketing Eggs Through the Creamery," and reprinted as Farmers' Bulletin 445.

## SHIPPING EGGS LOCALLY.

It is the general custom for the farmer in Kansas to dispose of his eggs through the country merchant or the cash buyer. The country merchant may in turn either sell to the local cash buyer or ship his receipts independently to commission men or car-lot shippers in sur-

rounding cities. In most towns where cash buyers are located it is usual for the merchant to dispose of his receipts through this channel. In many towns, however, there is not enough business to support a cash buyer, and in such cases the merchants ship to the firm offering highest quotations. In cases where the cash buyer is a salaried agent of some large shipper or packer he of course forwards all receipts to the central plant, but should he be in business for himself the parties offering the best prices will receive the bulk of his trade.

In shipping the eggs both the country merchant and the cash buyer are often guilty of careless packing, which is responsible for a part of the breakage. It is a frequent occurrence to find old tattered fillers used which waste more money in time spent in packing the eggs in them than new ones would cost. Often no flats are used between the fillers, but a few thicknesses of newspaper are depended on to take their place. A small pad of excelsior should be placed in the bottom of each side of the case and on the top of the uppermost flats. These will provide elasticity and do much to prevent breakage. Frequently, too, the trouble is taken to nail the top of the case securely in the center. This is a mistake, as it prevents elasticity and is unnecessary if the top is nailed securely at the ends. Exceptionally large eggs, even though they may have strong shells, are almost sure to be broken if packed in the case, and will smear a large number of other eggs. In fact, any of the factors causing broken eggs result in a much greater loss than that of the eggs actually broken, for many others are so badly smeared that they must be classed in lower grades than they would otherwise be placed.

The eggs, after leaving the hands of the immediate collectors, are handled mainly by local freights. During this stage of their journey there is liberal room for improvement. The general rule of most railroads is that eggs or any other products which are to be shipped on the daily freight must be delivered at the depot at least one hour before scheduled train time. If all trains ran on scheduled time this rule would not be so harmful, but since this is the exception rather than the rule with the local freight, it often happens that the eggs remain exposed to the direct rays of the sun for several hours. During the months of June, July, August, and September the quality of the eggs suffers from this treatment. Plate IV, figure 2, shows a shipment of eggs which was exposed to the sun for six hours in a temperature ranging from 110° to 130° F. In accordance with the rule, these eggs were delivered at the depot one hour before train time. On this particular day, however, the freight was several hours late, and the eggs were allowed to remain in this extreme temperature until it arrived. Such a condition could be materially improved if the eggs were placed under a covered portion of the platform, where

they would be protected from the sun. It is only fair to say that such covered shelters are often available, but they are seldom utilized.

When the cases are loaded on the train they are placed either in a box car or in one end of an open stock car which is also used for live poultry. (See fig. 2.) The box car often contains empty oil barrels and freight of similar nature. These box cars are opened when a stop is made, and then only long enough to load the shipments from that station. If the day is warm the temperature inside the cars will often go as high as 106° F. and remain at that point for hours.



FIG. 2.—A stock car used for shipping poultry and eggs.

The temperature of the open stock cars is from 8 to 10 degrees lower than that in box cars during the hottest period of the day, and owing to the free circulation of air very much cooler after the sun has set. Coupled with this exposure to high temperature and injurious odors the eggs are, of course, subjected to violent but unavoidable shaking and jarring during the entire trip.

It should be said that at least one of the railroads operating in Kansas has taken a long step forward in the matter of handling eggs on the local freights. This road is running refrigerator cars into which the eggs are loaded, and the most favorable temperature possi-

ble to get under these conditions is maintained. Some of the packers consider this such an important feature in improving the quality of the eggs handled by them that they intend to run refrigerator cars at their expense over some of the lines from which they draw heavily.

The following are some of the most important ways in which the railroads can help in this movement for the improvement of quality in eggs: (1) Provide covered sections of station platforms and require that eggs waiting for shipment be stacked there out of the sun; (2) provide local refrigerator service for eggs; (3) if refrigerator service is deemed out of the question, provide stock cars rather than box cars for moving eggs during the summer months.

#### THE CAR-LOT SHIPPER.

After the eggs leave the hands of the country merchants and local cash buyers they are next handled by the packers and car-lot shippers. These men maintain central houses at important railroad junctions and at various other large towns and cities. They are keen, shrewd, business men, handling large quantities of eggs, so that they realize the necessity of good treatment after the product reaches their hands. While there is still room, no doubt, for considerable improvement in methods from this point on, this end of the trade is much further advanced at the present time than that represented by the producer and storekeeper, so that the greatest need for the improvement of methods of handling and thus of improving the quality of eggs is from the farm to the packing house.

During the course of the investigation of conditions it was found desirable to carry on certain experimental work. This consisted of following shipments of eggs which had been subjected to various conditions through to the packing house to determine the changes which took place. In this work a card, the front and back of which is shown below, was used in assembling the data. The work along this line thus far conducted is not yet sufficient to be conclusive, and is not, therefore, discussed in this bulletin.

[Front of card.]

[UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ANIMAL INDUSTRY.]

#### POULTRY AND EGG-MARKETING INVESTIGATIONS.

##### HANDLING EGGS.

Observer .....	Date .....	Experiment No. ....
Statement of experiment .....		
Material used .....		
Eggs produced by .....		
Date laid .....	Where held .....	Farmers' Card No. ....
Container and its condition .....		How long held .....
Date and hour left farm for market .....		

Haul to market or store by farmer:	Time .....	Miles .....
Container .....		
Wagon .....	Condition of road .....	
Haul to market or store by egg collector or huckster:	Card No. ....	Time .....
Container .....		Miles .....
Wagon .....	Condition of road .....	
Store or buyer to whom sold .....		Card No. ....
Date received at store .....	How long held .....	
Where held .....	Container and its condition .....	
How packed for shipment .....	Kind and condition of cases and fillers .....	
Date and hour left store for station .....	Length of haul .....	
Where held at station .....	How long held .....	Covered or uncovered .....
Size of shipment .....	Time put on car .....	
Kind of car .....	Eggs alone or eggs and poultry in car .....	
Length and time of railroad haul .....	Reloaded .....	

[Back of card.]

Date and time of arrival at packing house .....	Temperature of cooler .....
How handled at packing house: How long before put in cooler .....	Grading .....
Candling before or after cooling .....	Packing .....
Time held .....	How shipped .....
Date and hour put in car for shipment .....	Kind of car .....
To whom shipped .....	Date of shipment .....
Remarks: .....	
.....	
.....	
.....	

GRADE OF EGGS.

	Total eggs.	Full and fresh.	Badly shrunkn.	Spots.	Blood rings.	Rots.	Checks.	Leak- ers.
At farm just before marketing.....								
At store on arrival.....								
At store just before shipment.....								
On arrival at packing house.....								
On leaving packing house.....								

### EDUCATIONAL WORK.

It must be remembered that while the farmers and storekeepers have a general idea of some things which cause eggs to spoil, there are many others of which they are unaware, and the importance of few, if any, are fully realized. In all probability they have not given the matter much thought, and since they have been able to sell all the eggs they produce, though at a comparatively low price to be sure, they have not realized that they are actually losers as the result of the spoiled eggs. It is necessary, therefore, to educate the farmer especially to the true condition of affairs.

In its work the bureau has kept this point in mind and has made an effort to disseminate information on the matter wherever possible.



The packers and car-lot shippers have also realized the benefits which would accrue from giving the matter publicity and have distributed circulars and other printed matter pointing out the most essential features to be observed in caring for eggs.

In connection with the investigation of conditions on the farm the men engaged in this work came into personal contact with a large number of farmers and housewives and explained to them the aims of the movement and the benefits to be derived from it. It is interesting to note that in the case of nearly all farmers visited greater interest is now being taken in their poultry, and much greater care is being given to the eggs. It is a noticeable fact that as soon as a farmer becomes interested in better poultry or in better methods of caring for them he takes better care of the product. Special pains were taken, therefore, to give good practical help along any poultry lines which the farmer wished. The desire for information concerning housing, feeding, etc., also the best breeds to keep, and as to which were the best birds in the flock, etc., was astonishing. By supplying this information the confidence of the farmer was won and his help and support secured in the effort to improve the quality of the eggs.

Many country stores were also visited. The object of these visits was to become acquainted with the merchants and discuss with them the loss-off system of buying. The majority of these merchants know little or nothing about candling, and by practical demonstration it was possible to show them that it would not be a very difficult matter to become expert enough to be able to detect rots, spots, and blood rings.

Some educational work can also be carried on through the poultry shows. Anything which increases the interest in better poultry helps along the movement for the improvement of eggs. Poultry shows, particularly those held in the smaller towns, have a great influence along this line. A judge who will spend some time explaining the good points of birds and giving reasons for awards can increase the educative value of the show wonderfully. Exhibits of eggs and market poultry can often be arranged. Packers or produce men can occasionally be found who will provide attractive prizes for these classes. The bureau has in some instances furnished judges for these small shows and has frequently sent speakers for the purpose of giving talks concerning the care and handling of eggs. It has also been possible to extend the educational work by referring those interested to the publications of the United States Department of Agriculture and those issued by the State experiment stations on poultry subjects.

#### RESULTS OF FIRST SEASON'S WORK.

Although but one season has been spent by the bureau in this work, several much-desired changes have been brought about. The most



important of these was the adoption by the Kansas car-lot shippers of the loss-off system of buying and selling eggs. The immediate effect of this system was a marked improvement in the quality of Kansas eggs, and this was so apparent to the men engaged in handling them that they became intensely interested in the bureau's work and voluntarily offered their assistance in every possible way.

#### EXTENSION OF THE MOVEMENT TO OTHER STATES.

As a result of its success during the past summer, the loss-off system of buying has become more firmly established in Kansas. It also led to a meeting at Kansas City, on December 20, 1910, of the State pure-food officials from Kansas, Nebraska, Iowa, Missouri, and Oklahoma, with a committee of car-lot shippers of eggs, to discuss the matter of administration and the enactment of suitable legislation. It is believed that the Kansas law may be improved upon so that the work may be made more effective, and for the purpose of enacting uniform legislation in the States represented the following bill was drafted at the meeting for recommendation to the respective legislatures of the States represented:

**AN ACT** For the protection of public health and the prevention of fraud by regulating the sale of eggs for food purposes, providing penalties for the violation thereof, and providing for the enforcement thereof.

*Be it enacted by the Legislature of the State of Kansas:*

**SECTION 1.** It shall be unlawful for any person, firm, or corporation engaged in the buying and shipping of eggs, to buy, sell, barter, trade, or deliver, or to offer to buy, sell, barter, trade, or deliver any eggs for food purposes between the 1st day of June and the 31st day of December of each year, without first candling said eggs, or causing the same to be candled; and any such person, firm, or corporation who shall buy, sell, barter, trade, or deliver, or offer to buy, sell, barter, trade, or deliver any such eggs without first candling the same, or causing the same to be candled, and without first removing all decayed, decomposed, and spot eggs from those candled, shall be guilty of a misdemeanor and punished as hereinafter provided.

**SEC. 2.** The word "candle," as used herein, shall be construed to mean the examination of eggs by means of natural or artificial light, in such a manner as to disclose to the person examining the same whether the eggs so examined are decayed, decomposed, or spot eggs.

**SEC. 3.** That the State board of health is authorized and directed to make and publish uniform rules and regulations, not in conflict with the laws of this State, for carrying out the provisions of this act. Any person who shall violate any of the rules and regulations so made, and published in the official State paper, shall be deemed guilty of a misdemeanor, and on conviction shall be punished by a fine of not less than ——— dollars, or more than ——— dollars.

**SEC. 4.** That a case of eggs shall contain 30 dozen, and it shall not be considered as a violation of this act for any person, firm, or corporation to buy or sell, or offer to buy or sell, any case of eggs for food purposes that does not contain more than 2½ per cent of decayed, decomposed, or spot eggs.

SEC. 5. Any person, firm, or corporation convicted of violating any provision of this act shall be punished by a fine in the sum of not less than —— dollars, nor more than —— dollars.

SEC. 6. This act shall take effect and be in force from and after its publication in the statute book.

In addition to the States named, there is considerable interest on the subject manifested in other Western States. The senior author of this bulletin was invited to meet the State dairy and food commissioner and egg buyers of South Dakota in January for the purpose of discussing methods of improving the egg trade in that State, and also addressed the Michigan Car Lot Shippers' Association at their annual meeting in Detroit in February, 1911, where much interest was evidenced in the subject.

In inaugurating such a movement, the first essential is an organization of buyers agreed to buy only on a loss-off basis; the second is the firm cooperation of the State authorities to prevent the shipment of bad eggs within the State. The one is practically useless without the other.

#### SUMMARY.

The Bureau of Animal Industry carried on work during the summer of 1910 in the State of Kansas with the object of improving the quality of the eggs marketed in that State. As a result of this work, the loss-off method of buying eggs has been quite generally adopted by the car-lot shippers and has resulted in a most gratifying improvement in the eggs. Considerable interest in the movement has been aroused in other States, so that it bids fair to spread rapidly.

In connection with the work a careful investigation of all the conditions surrounding the handling of eggs, from the time they are produced on the farm until they reach the packing house, has been made for the purpose of determining the preventable factors causing loss of quality. As a result of this investigation the following suggestions are made for the farmer, the country merchant and cash buyer, the railroad, and the car-lot shipper.

#### SUGGESTIONS FOR FARMER.

1. Improve your poultry stock.
2. Keep one of the general-purpose breeds, such as the Plymouth Rock, Wyandotte, Orpington, or Rhode Island Red.
3. Provide one clean, dry, vermin-free nest for every four or five hens.
4. Conclude all hatching by May 15 and sell or confine male birds during the remainder of the summer.
5. Gather eggs once daily during ordinary times, and twice daily during hot or rainy weather.

6. In summer place eggs as soon as gathered in a cool, dry room.
7. Use all small and dirty eggs at home.
8. Market eggs frequently—twice a week, if possible—during the summer.
9. In taking eggs to market protect them from the sun's rays.
10. In selling, insist that the transaction be on a loss-off basis, for if care has been given the eggs this system will yield more money to the producer.

#### SUGGESTIONS FOR THE COUNTRY MERCHANT AND CASH BUYER.

1. Candle all eggs and buy on a loss-off basis.
2. Allow the farmer to see you candle his eggs occasionally and return those rejected if he wishes them.
3. Pack carefully in strong clean cases and fillers.
4. Do not keep in a musty cellar or near oil barrels or other odoriferous merchandise.
5. Ship daily during warm weather.

#### SUGGESTIONS FOR RAILROAD OFFICIALS.

1. Provide a covered portion of station platforms where egg cases can be stacked and see that the agent stacks them there.
2. Provide refrigeration for the eggs on the local freight.
3. Where refrigerator cars are used on local freights, see that the doors are kept closed when not loading.
4. If refrigeration can not be supplied, provide stock cars rather than box cars for this purpose during the summer.
5. Where box cars are used for eggs do not allow freight which may hurt their quality, such as oil barrels, to be loaded in the same car.

#### SUGGESTIONS FOR THE CAR-LOT SHIPPER.

1. Buy strictly on a loss-off basis.
2. Encourage the smaller buyers to trade on a loss-off basis.
3. Join the State Car Lot Shippers' Association.
4. Cooperate with other shippers and the State officials in bringing about this system of buying.
5. Keep the subject agitated and before the people. In other words, educate them.





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